GOLDEN OIL COMPANY, LOT 410 LEASE
(Six Pipes)
Allegheny National Forest
Oil Heritage ~~Recording Project~~
Sheffield Field
Donaldson Vicinity
Warren County
Pennsylvania

HAER No. PA-440

HAER
PA
62-DONA.V,
1-

PHOTOGRAPHS

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
Department of the Interior
1849 C Street, NW
Washington, DC 20240

ADDENDUM TO: HAER PA-440
GOLDEN OIL COMPANY, LOT 410 LEASE *PA,62-DONA.V,1-*
(Six Pipes)
Sheffield Field
Donaldson vicinity
Warren County
Pennsylvania

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

ADDENDUM TO
GOLDEN OIL COMPANY, LOT 410 LEASE
(Six Pipes)

HAER NO. PA-440

LOCATION: Sheffield Field, Donaldson vicinity, Warren County, Pennsylvania
UTM: 17.667475.4613135

DATE OF CONSTRUCTION: ca. 1920

PRESENT OWNER: Allegheny National Forest

PRESENT USE: Abandoned

SIGNIFICANCE: Pennsylvania is the birthplace of the petroleum industry, signified by the drilling of Edwin Drake's well near Titusville in 1859. Many widely used techniques of drilling and pumping oil were first developed here in the effort to recover the high-quality "Pennsylvania Grade" oil. One particularly important, and successful, technique perfected in Pennsylvania was the "central power" pumping of numerous low-production wells to economically recover small amounts of oil. This method of production flourished between ca. 1890 and ca. 1950, and today there are only scattered remains of the once common pumping technique. The Golden Oil Company, Lot 410 Lease is an excellent example of a smaller, centrally powered pumping operation.

HISTORIAN: Michael W. Caplinger, 1997.

PROJECT INFORMATION: The Allegheny National Forest Oil Heritage Recording Project was undertaken during the summer of 1997 by the Historic American Engineering Record (HAER, Eric DeLony, Chief), a long-range program to document historically significant engineering, industrial and maritime works in the United States. The program is part of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Division of the National Park Service, U.S. Department of the Interior. This project was sponsored by cooperative agreements between HABS/HAER, E. Blaine Cliver, Chief; the West Virginia University Institute for the History of Technology and Industrial Archaeology (IHTIA), Dr. Emory Kemp, Director; and Allegheny National Forest (ANF), a unit of the Eastern Region of the U.S. Department of Agriculture (USDA) Forest Service, John Palmer, Supervisor. The Southwestern

Pennsylvania Heritage Preservation Commission, Randy Cooley, Director, provided major funding.

The field work, measured drawings, historical reports and photographs were prepared under the general direction of Christopher Marston, HAER Project Leader, with consultation from Phil Ross, ANF Historian. The field team was led by Eric Elmer, HAER Field Architect Supervisor and Michael Caplinger, IHTIA Historian. The team included Arturs Lapins, US/ICOMOS Intern (Latvia); and IHITA delineators Paul Boxley, Scott Daley, Kara Hurst, and Kevin McClung. John T. Nicely produced the large format photography.

See also HAER No. PA-436, “Allegheny National Forest Oil Heritage,” for a broad overview of the history of oil production in Pennsylvania and the history and operation of central power well-pumping systems.

INTRODUCTION

While petroleum sometimes would flow from a well under its own pressure, this was not usually the case. Most successful oil wells in Appalachia followed a pattern of high initial production (sometimes hundreds of barrels per day per well) followed by a rapid drop off to a few barrels per day--or week--or nothing at all. Thereafter, the well had to be mechanically pumped to recover any oil. By the 1870s, the "standard" pumping outfit was in use in Pennsylvania. Much of the surface equipment used to drill a well (the engine, bandwheel, and walking beam) could also be used to pump it. This was a one-engine-one-well system in which a steam-powered engine pumped a single well, termed "pumping on the beam."

After a well aged and production leveled off, it required pumping for only a short period, perhaps once or a few times a week.[1] In the decade following the establishment of Drake's well, there was little impetus for pumping low-production wells after their initial outflow, since new fields were continually being discovered and the drillers could simply move on to sink another well. There were exceptions, however, such as when the oil tapped by a well was of extremely high quality. With oil prices extremely low, though, it cost too much to outfit, maintain and equip an installation at each well. As prices began to stabilize in the 1880s, pumping became more feasible, and economization of the process became the key to profitability. This drive for efficiency resulted in the popularization of centrally powered multiple-well pumping systems, which were perfected in Pennsylvania's oil fields.

The essential components of a central power system were: the prime mover, or engine; a power reduction/motion-conversion/power distribution unit (always called the "power" in oil-field parlance, not to be confused with the engine or prime mover), which converted the engine's rotary motion to horizontal reciprocating motion; the shackle lines (also called pull, jerker or rod lines), which transmitted the reciprocating motion from the power out to the pump jacks; the pump jacks, which converted the horizontal reciprocating motion of the rod lines to vertical reciprocating motion; and finally, the sucker rods, which operated valves at the bottom of the well that pumped the oil to the surface. The engine and power required a substantial concrete foundation to resist the immense strains put on the machinery, and both were enclosed in a protective powerhouse. Powerhouses not only lessened the chance for fires, but also held spare parts and tools and gave the pumper and machinery protection from the elements. These equipment configurations were generally called central powers, but the term "jack plant" was also common. With the advent of gas and oil powered engines in the mid 1890s, costs were further lowered since the engine was powered by gas produced from the very wells it was pumping--a sort of low-cost perpetual pumping machine that required little manpower or maintenance to keep in operation. By about 1900, numerous oil-well supply companies had developed standardized systems that could be purchased in part or whole.

Certain factors controlled the use of central powers. Wells had to be relatively shallow, less than 3,000'. While up to forty shallow wells could theoretically be pumped by a well-balanced high-powered system, fifteen to twenty was a more common number. The wells had to be in relatively close proximity, within a mile. Although the shackle lines could be routed over and

[1] To increase production, a well could be "shot" or "torpedoed" with nitroglycerin to extensively fracture the oil sands at the bottom of the hole.

around difficult terrain, extreme topography could hinder their use and was sometimes better suite to individual wells pumping "on the beam." While central power systems flourished between ca. 1880 and ca. 1950, the "unit pumper," a self-contained pumping machine powered by a small gasoline engine or electric motor, succeeded them.

GEOLOGY

The Golden Oil powerhouse is located in the Cooper field. A portion of the field north of this site was called the Sheffield Field when discovered in 1875, but later all were combined under the Cooper field. Evidently constructed by the Golden Oil Company, the powerhouse dates to ca. 1920, although the machinery seems to be somewhat older, ca. 1900. Wells here produce from the Cooper sand and Cooper stray sand. The Cooper sand is most productive, lying at a depth of approximately 1,600', 50' to 90' below the Clarendon (or Tiona) sands. The productive area of the Cooper sand is some 15 miles in length and 2 miles wide. It averages 24' in thickness and was generally torpedoed with 40 to 100 quarts of nitroglycerine. The Cooper Stray sand averages 20' in thickness. The two are sometimes separated by up to 25' of shale and siltstone. Secondary recovery (by waterflooding) was attempted in a portion of the field after the 1920s but was not successful.[2] The eight wells here probably each produced less than a barrel a day. The operation closed around 1970.

MACHINERY AND THE POWERHOUSE

The prime mover is a Lilly Machine Works gas engine (with electronic spark-plug ignition) of probably 25 horsepower with one flywheel.[3] This is a "half-breed," meaning it is an old steam engine upgraded to a gas engine by replacing the cylinder head and some minor parts, which was a very popular practice in the late 1890s. Overall, the engine is in excellent condition. A brass, sight-feed oiler remains on the engine (a rare occurrence), as does the clutch mechanism, belt pulley, and the 1"-wide power transmission belt. Gas from a nearby well-head, which first passed through a gasometer (situated near the building) to stabilize the pressure before continuing into the engine room, fired the engine. A small, steel coolant tank in the engine room, operating on a thermal siphon principal, circulated water to the engine's cylinder jacket. The engine is mounted on a concrete foundation, although the remainder of the building has dirt floors. The power belt passes through an opening in the room's west wall, through the beltway and into the structure housing the power.

The power, which actuated eight rod lines, is a small Bessemer Company (of Grove City, Pennsylvania) geared crank-and-disk unit mounted on a concrete foundation. Since it tilts slightly to match the slope of the hillside, it could be called a "hillside geared-power." The rod lines connected with a clevis and pin fittings, and there are extra pins hanging on the wall.

---

[2] William Lytle and Joseph Goth, *Oil and Gas Geology of the Kinzua Quadrangle, Warren and McKean Counties, Pennsylvania* (Harrisburg: Commonwealth of Pennsylvania, 1970), 25.
[3] Lilly was located in Rexford, Pennsylvania.

The shackle lines are 1” diameter steel rods (with some cable sections incorporated) carried on steel-pipe friction posts and swing posts. The pump jacks are direct-lift underpull units manufactured by the W.C. Norris Company of nearby Tiona.

Golden Oil powerhouse sits in a shallow hollow, sheltered on a south-facing hillside, and is in comparatively good condition. It consists of two small, rectangular buildings and a connecting belt tunnel or shed. The engine room is a small, rectangular, wood-frame structure covered with horizontal wood siding (except for the beltway, which was sheathed in corrugated tin sheet) and roofed with asphalt shingles. There are small windows in the north and south walls that provide some light. One door in the east wall allows access. The engine room interior is not fire-proofed with tin sheeting, and the framing is exposed. The beltway is a wood-frame tunnel sheathed in corrugated tin sheets.

The power building is even smaller than the engine room. It is a rectangular, wood-frame structure with horizontal wood siding, no windows and a single door in the north wall. The framing is exposed in the interior. Extra cross braces between the vertical framing are laid at an angle to match the tilt of the power and support the shackle lines as they exit the building. There are no other standing structures on the site.

Local contractors specializing in pumping plant construction obtained the construction materials locally and erected the buildings. The machinery was put in place first, and then the building was erected around it.

One or two men who started the engine and pumped the wells two or three times a week probably maintained and operated this jack plant. A single pumping cycle usually lasted than two hours. Each well likely produced less than three barrels of oil per week.

BIBLIOGRAPHY

Arnold, Ralph and William Kemnitzer. *Petroleum in the United States and Possessions*. New York: Harper Brothers Publishers, 1931.

Bacon, Raymond Foss and William Hamor. *The American Petroleum Industry*. Volume I. New York: The McGraw-Hill Book Company, 1916.

George, H.C. *Surface Machinery and Methods for Oil-Well Pumping*. Department of the Interior Bureau of Mines Bulletin 224. Washington, DC: Government Printing Office, 1925.

Lytle, William and Joseph Goth. *Oil and Gas Geology of the Kinzua Quadrangle, Warren and McKean Counties, Pennsylvania*. Pennsylvania Geological Survey Mineral Resource Report 62. Harrisburg: Commonwealth of Pennsylvania, 1970.